SEQUENCE LISTING

<110> Levy, Ilan
Shoseyov, Oded
Nussinovitch, Amos

<120> MODIFICATION OF POLYSACCHARIDE CONTAINING MATERIALS

<130> 01/22952

<160> 13

<170> PatentIn version 3.1

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<212> DNA
<213> Clostridium cellulovorans

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atgacgtaaa agttagatat tattacacaa gtgatggtac acaaggacaa actttctggt 180

gtgaccatgc tggtgcatta ttaggaaata gctatgttga taacactagc aaagtgacag 240

caaacttcgt taaagaaaca gcaagcccaa catcaaccta tgatacatat gttgaatttg 300

gatttgcaag cggacgagct actcttaaaa aaggacaatt tataactatt caaggaagaa 360

taacaaaatc agactggtca aactacactc aaacaaatga ctattcattt gatgcaagta 420

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gtacagcacc ataggatcca gatgtac 507

<210> 2

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<213> Clostridium cellulovorans

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20 25 30

Ser Asp Ser Asp Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr
35 40 45

Thr Ser Asp Gly Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala Gly
50 55 60

Ala Leu Leu Gly Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr Ala
65 70 75 80

Asn Phe Val Lys Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr
85 90 95

Val Glu Phe Gly Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln
100 105 110

Phe Ile Thr Ile Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr
115 120 125

Thr Gln Thr Asn Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro Val
130 135 140

Val Asn Pro Lys Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly
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Thr Ala Pro

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<213> Clostridium cellulovorans

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attattacac aagtgatggt acacaaggac aaactttctg gtgtgaccat gctggtgcat 180

tattaggaaa tagctatgtt gataacacta gcaaagtgac agcaaacttc gttaaagaaa 240

cagcaagccc aacatcaacc tatgatacat atgttgaatt tggatttgca agcggacgag 300

ctactcttaa aaaaggacaa tttataacta ttcaaggaag aataacaaaa tcagactggt 360

caaactacac tcaaacaaat gactattcat ttgatgcaag tagttcaaca ccagttgtaa 420

atccaaaagt tacaggatat ataggtggag ctaaagtact tggtacagca ccaggtccag 480

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<212> PRT

<213> Clostridium cellulovorans

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Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn
20 25 30

Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly Thr Gln
35 40 45

Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser
50 55 60

Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr
65 70 75 80

Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala
85 90 95

Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly
100 105 110

Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr
115 120 125

Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr
130 135 140

Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly Pro Asp
145 150 155 160

Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp Pro Gly
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Thr Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg Ile
180 185 190

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<213> Clostridium cellulovorans

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attattacac aagtgatggt acacaaggac aaactttctg gtgtgaccat gctggtgcat 180

tattaggaaa tagctatgtt gataacacta gcaaagtgac agcaaacttc gttaaagaaa 240

cagcaagccc aacatcaacc tatgatacat atgttgaatt tggatttgca agcggacgag 300

ctactcttaa aaaaggacaa tttataacta ttcaaggaag aataacaaaa tcagactggt 360

caaactacac tcaaacaaat gactattcat ttgatgcaag tagttcaaca ccagttgtaa 420

atccaaaagt tacaggatat ataggtggag ctaaagtact tggtacagca ccaggtccag 480

atgtaccatc ttcaataatt aatcctactt ctgcaacatt tgatcccggt accatggcag 540

cgacatcatc aatgtcagtt gaattttaca actctaacaa atcagcacaa acaaactcaa 600

ttacaccaat aatcaaaatt actaacacat ctgacagtga tttaaattta aatgacgtaa 660

aagttagata ttattacaca agtgatggta cacaaggaca aactttctgg tgtgaccatg 720

ctggtgcatt attaggaaat agctatgttg ataacactag caaagtgaca gcaaacttcg 780

ttaaagaaac agcaagccca acatcaacct atgatacata tgttgaattt ggatttgcaa 840

gcggacgagc tactcttaaa aaaggacaat ttataactat tcaaggaaga ataacaaaat 900

cagactggtc aaactacact caaacaaatg actattcatt tgatgcaagt agttcaacac 960

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<212> PRT

<213> Clostridium cellulovorans

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Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn
            20                  25                  30

Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly Thr Gln
        35                  40                  45

Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser
    50                  55                  60

Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr
65                  70                  75                  80

Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala
                85                  90                  95

Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly
            100                 105                 110

Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr
        115                 120                 125
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Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr
    130                 135                 140

Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly Pro Asp
145                 150                 155                 160

Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp Pro Gly
                165                 170                 175

Thr Met Ala Ala Thr Ser Ser Met Ser Val Glu Phe Tyr Asn Ser Asn
            180                 185                 190

Lys Ser Ala Gln Thr Asn Ser Ile Thr Pro Ile Ile Lys Ile Thr Asn
        195                 200                 205

Thr Ser Asp Ser Asp Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr
    210                 215                 220

Tyr Thr Ser Asp Gly Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala
225                 230                 235                 240

Gly Ala Leu Leu Gly Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr
                245                 250                 255

Ala Asn Phe Val Lys Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr
            260                 265                 270
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Tyr Val Glu Phe Gly Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly
275 280 285

Gln Phe Ile Thr Ile Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn
290 295 300

Tyr Thr Gln Thr Asn Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro
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Val Val Asn Pro Lys Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu
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Gly Thr Ala Pro
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<223> Recombinant protein sequence

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<222> (3)..(791)
<223> Taken pRIT2T cloning vector

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<221> misc_feature

<222> (795)..(1280)

<223> Taken from cbpA gene

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actctcaagc tccaaaagct gatgcgcaac aaaataactt caacaaagat caacaaagcg 180

ccttctatga aatcttgaac atgcctaact taaacgaagc gcaacgtaac ggcttcattc 240

aaagtcttaa agacgaccca agccaaagca ctaacgtttt aggtgaagct aaaaaattaa 300

acgaatctca agcaccgaaa gctgataaca atttcaacaa agaacaacaa aatgctttct 360

atgaaatctt gaatatgcct aacttaaacg aagaacaacg caatggtttc atccaaagct 420

taaaagatga cccaagccaa agtgctaacc tattgtcaga agctaaaaag ttaaatgaat 480

ctcaagcacc gaaagcggat aacaaattca acaaagaaca acaaaatgct ttctatgaaa 540

tcttacattt acctaactta aacgaagaac aacgcaatgg tttcatccaa agcctaaaag 600

atgacccaag ccaaagcgct aacctttag cagaagctaa aaagctaaat gatgctcaag 660

caccaaaagc tgacaacaaa ttcaacaaag aacaacaaaa tgctttctat gaaattttac 720

atttacctaa cttaactgaa gaacaacgta acggcttcat ccaaagcctt aaagacgatc 780

cggggaattc catggcagcg acatcatcaa tgtcagttga attttacaac tctaacaaat 840

cagcacaaac aaactcaatt acaccaataa tcaaaattac taacacatct gacagtgatt 900

taaatttaaa tgacgtaaaa gttagatatt attacacaag tgatggtaca caaggacaaa 960

ctttctggtg tgaccatgct ggtgcattat taggaaatag ctatgttgat aacactagca 1020

aagtgacagc aaacttcgtt aaagaaacag caagcccaac atcaacctat gatacatatg 1080

ttgaatttgg atttgcaagc ggacgagcta ctcttaaaaa aggacaattt ataactattc 1140

aaggaagaat aacaaaatca gactggtcaa actacactca aacaaatgac tattcatttg 1200

atgcaagtag ttcaacacca gttgtaaatc caaaagttac aggatatata ggtggagcta 1260

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<212> PRT

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<223> Recombinant protein sequence

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<221> misc_feature

<222> (1)..(263)

<223> Protein A sequence, from cloning vector

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<221> misc_feature

<222> (265)..(426)

<223> cbpA protein

<400> 8

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            20                  25                  30

Gly Glu Ala Gln Lys Leu Asn Asp Ser Gln Ala Pro Lys Ala Asp Ala
        35                  40                  45

Gln Gln Asn Asn Phe Asn Lys Asp Gln Gln Ser Ala Phe Tyr Glu Ile
    50                  55                  60

Leu Asn Met Pro Asn Leu Asn Glu Ala Gln Arg Asn Gly Phe Ile Gln
65                  70                  75                  80

Ser Leu Lys Asp Asp Pro Ser Gln Ser Thr Asn Val Leu Gly Glu Ala
                85                  90                  95

Lys Lys Leu Asn Glu Ser Gln Ala Pro Lys Ala Asp Asn Asn Phe Asn
            100                 105                 110

Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu Asn Met Pro Asn Leu
        115                 120                 125

Asn Glu Glu Gln Arg Asn Gly Phe Ile Gln Ser Leu Lys Asp Asp Pro
    130                 135                 140
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Ser Gln Ser Ala Asn Leu Leu Ser Glu Ala Lys Lys Leu Asn Glu Ser
145                 150                 155                 160

Gln Ala Pro Lys Ala Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala
                165                 170                 175

Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn
            180                 185                 190

Gly Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu
        195                 200                 205

Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala Pro Lys Ala Asp
    210                 215                 220

Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His
225                 230                 235                 240

Leu Pro Asn Leu Thr Glu Glu Gln Arg Asn Gly Phe Ile Gln Ser Leu
                245                 250                 255

Lys Asp Asp Pro Gly Asn Ser Met Ala Ala Thr Ser Ser Met Ser Val
            260                 265                 270

Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr Asn Ser Ile Thr Pro
        275                 280                 285
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Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn Leu Asn Asp
    290                 295                 300

Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly Thr Gln Gly Gln Thr
305                 310                 315                 320

Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser Tyr Val Asp
                325                 330                 335

Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr Ala Ser Pro
            340                 345                 350

Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala Ser Gly Arg
        355                 360                 365

Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly Arg Ile Thr
    370                 375                 380

Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr Ser Phe Asp
385                 390                 395                 400

Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr Gly Tyr Ile
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Gly Gly Ala Lys Val Leu Gly Thr Ala Pro
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<222> (652)..(981)

<223> Taken from bovine

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aactctaaca aatcagcaca aacaaactca ttacaccaa taatcaaaat tactaacaca 180

tctgacagtg atttaaattt aaatgacgta aaagttagat attattacac aagtgatggt 240

acacaaggac aaactttctg gtgtgaccat gctggtgcat tattaggaaa tagctatgtt 300

gataacacta gcaaagtgac agcaaacttc gttaaagaaa cagcaagccc aacatcaacc 360

tatgatacat atgttgaatt tggatttgca agcggacgag ctactcttaa aaaaggacaa 420

tttataacta ttcaaggaag aataacaaaa tcagactggt caaactacac tcaaacaaat 480

gactattcat ttgatgcaag tagttcaaca ccagttgtaa atccaaaagt tacaggatat 540

ataggtggag ctaaagtact tggtacagca ccaggtccag atgtaccatc ttcaataatt 600

aatcctactt ctgcaacatt tgatcccggt accatgggtc ctcctcctgg aagcacttcc 660

gctgccagca gctccaacta ttgcaaccag atgatgaaga gccggaacct gaccaaagat 720

cgatgcaagc cagtgaacac ctttgtgcac gagtccctgg ctgatgtcca ggccgtgtgc 780

tcccagaaaa atgttgcctg caagaatggg cagaccaatt gctaccagag ctactccacc 840

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accacccagg cgaataaaca catcattgtg gcttgtgagg gaaacccgta cgtgccagtc 960

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<223> Recombinant protein sequence

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<222> (30)..(208)

<223> Taken from Clostridium cellulovorans

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<221> misc_feature

<222> (226)..(326)

<223> Taken from bovine

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            20                  25                  30

Ser Ser Met Ser Val Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr
        35                  40                  45

Asn Ser Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp
    50                  55                  60

Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly
65                  70                  75                  80

Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly
                85                  90                  95

Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys
            100                 105                 110
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Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly
        115                 120                 125

Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile
    130                 135                 140

Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn
145                 150                 155                 160

Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys
                165                 170                 175

Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly
            180                 185                 190

Pro Asp Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp
        195                 200                 205

Pro Gly Thr Met Gly Pro Pro Pro Gly Ser Thr Ser Ala Ala Ser Ser
    210                 215                 220

Ser Asn Tyr Cys Asn Gln Met Met Lys Ser Arg Asn Leu Thr Lys Asp
225                 230                 235                 240

Arg Cys Lys Pro Val Asn Thr Phe Val His Glu Ser Leu Ala Asp Val
                245                 250                 255
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Gln Ala Val Cys Ser Gln Lys Asn Val Ala Cys Lys Asn Gly Gln Thr
260 265 270

Asn Cys Tyr Gln Ser Tyr Ser Thr Met Ser Ile Thr Asp Cys Arg Glu
275 280 285

Thr Gly Ser Ser Lys Tyr Pro Asn Cys Ala Tyr Lys Thr Thr Gln Ala
290 295 300

Asn Lys His Ile Ile Val Ala Cys Glu Gly Asn Pro Tyr Val Pro Val
305 310 315 320

His Phe Asp Ala Ser Val
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<223> single strand DNA oligonucleotide

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<212> DNA

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